



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,300	03/29/2007	Greg Charache	14564-021US1	8947
26161	7590	04/29/2010	EXAMINER	
FISH & RICHARDSON PC			NGUYEN, PHILLIP	
P.O. BOX 1022				
MINNEAPOLIS, MN 55440-1022			ART UNIT	PAPER NUMBER
			2828	
			NOTIFICATION DATE	DELIVERY MODE
			04/29/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No. 10/597,300	Applicant(s) CHARACHE ET AL.	
	Examiner PHILLIP NGUYEN	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 January 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-4,6,7,9,13-17,20,21,23-28,35,41 and 43-70 is/are pending in the application.
- 4a) Of the above claim(s) 2,3,6,48,53,55-57,62,63,68 and 70 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 35-37,41,43,61 and 67 is/are allowed.
- 6) ☒ Claim(s) 1,4,7,9,13-17,20,21,23-26,28,44-47,49-52,54,58-60,64-66 and 69 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

3DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1, 4, 7, 9, 13-17, 20-21, 23-26, 28, 44-47, 49-52, 54, 58-60, 64-66 and 69 have been considered but are moot in view of the new ground(s) of rejection.

It's further noted that rejections of claims 4, 18, 21, 40, 51, 66 and 69 (based on 112 first paragraph rejections) are now withdrawn because there are supports for the claimed inventions. However, the supports are only shown in the original specification of the application but NOT in the Publication (US 20080253421). In order words, the Publication does not include all information shown in the original specification.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13-14 and 65 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Art Unit: 2828

The claims recite “the reflector is configured to focus the light” and “the reflector is adapted for focusing the light” which are not clear. It would make sense if a lens is configured to focus light but NOT this type of reflector (VBG or photonic crystal or interference filter) unless it is a concave mirror.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 13-14, 16-17, 20, 23-26, 28, 44, 46-47, 49-50, 52, 64 and 66 are rejected under 35 U.S.C. 102(e) as being anticipated by Volodin et al. (Holographic Volume Bragg Gratings Stabilize Laser Diode Performance, November 2003, provided as admitted prior art by applicant, which is hereby referred as “APA”).

With respect to claim 1, APA discloses in Fig. 1 a light source comprising:

a multi-spatial mode semiconductor diode laser (gray block on the left); and

a reflector (dark block, volume Bragg grating) having a three-dimensional pattern of refractive index variations within the reflector, the reflector being in optical communication with

Art Unit: 2828

the semiconductor diode laser to receive an output beam of the diode laser, such that a portion of the light in the output beam is reflected back into the laser by the reflector to stabilize one or more of the spatial beam quality and the spectral line width of the diode laser,

wherein the reflector has a reflectivity spectral width that is less than 0.2 nm (page 69).

With respect to claims 13-14 and 26, APA discloses that the reflector is configured to focus the output beam from the diode laser along both fast axis and slow axis of the diode laser using the focusing lens between the diode laser and the reflector.

With respect to claim 16, since the claim fails to define "a desired optical mode" relative to other mode; any select mode is considered as the desired mode. It's clear that APA is attempting to achieve at least a fundamental mode (second paragraph of col. 3 to col. 1 of pages 69-70).

With respect to claims 17 and 20, Fig. 1 clearly shows the output beam of the light source has a Gaussian profile or single longitudinal mode.

With respect to claim 23, APA discloses the light source being configured to precisely produce an output with a defined center wavelength (col. 3, page 68) which is considered as injection lock the wavelength of the output beam of the diode laser.

With respect to claim 24, Fig. 1 illustrates the diode laser and the reflector being arranged in an external cavity configuration.

With respect to claim 25, Fig. 1 further illustrates a lens between the laser and the reflector.

Art Unit: 2828

With respect to claim 28, APA further discloses in column 1, page 68 the use of laser diode array in place of the multimode laser.

With respect to claim 44, see the title of the APA.

With respect to claim 46, since the claim does not further limit the claimed invention by providing additional structure to the laser source of claim 1, it is inherent that the light reflected back into the diode laser by the reflector acting to discriminate undersigned spectral modes.

With respect to claim 47, the claim fails to define "significant feedback". Therefore the feedback provided by the reflector is considered significant.

With respect to claim 49, APA discloses using the multimode laser with the reflector which means the laser itself is a multi-spatial mode diode laser.

With respect to claim 50, the claim fails to clearly define whether if the reflector is in "direct" contact or "indirect" contact with a rear facet of the diode laser, it is Examiner's position to give the broadest reasonable interpretation to the claim. In this case, it is considered as indirect contact. Therefore APA discloses the claimed invention.

With respect to claim 52, APA further discloses in the first paragraph of col. 1 the use of the light source for pumping solid-state lasers. It is inherent that the solid-state laser would include an active laser medium that absorbs at least a portion of the output beam and is pumped by the output beam.

With respect to claim 64, the claim is similar to claim 1 except having the reflector "is adapted to stabilize the lateral mode of the semiconductor diode laser by discriminating some lateral modes to increase a brightness of the output beam." As mentioned in the rejection of

Art Unit: 2828

claim 16, APA discloses the reflector to enhance to a single mode by discriminating other modes.

With respect to claim 66, the claim further recites “such that the emission spectrum of the laser is stabilized to within about 0.2 nm over a range of about 35 C and over a drive current that changes by a factor of 2.5.” However, the claim does not further provide additional structure that would distinct the claimed reflector over the reflector provided by the APA. Furthermore, the specification only discloses by adding to the reflector to the laser, the emission spectrum is stabilized over the claimed ranges of temperature and the drive current change. Therefore, it is inherent that the emission spectrum of the APA would be stabilized over the claimed temperature and current factor.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 4 and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Volodin et al. (Holographic Volume Bragg Gratings Stabilize Laser Diode Performance, November 2003, provided as admitted prior art by applicant, which is hereby referred as “APA”) in view of Heitmann et al. (US 6760513).

Art Unit: 2828

With respect to claim 4, APA discloses the claimed invention with the reflector having three-dimensional pattern as a volume Bragg grating (VBG). However, APA does not disclose a photonic bandgap crystal for the reflector.

Heitmann discloses the VBG and photonic bandgap crystal can be used in place of each other (col. 2, lines 3-10). In fact, it's well known that these devices could perform the same function for filtering wavelengths. It would have been obvious to one skilled in the art at the time the invention was made to use photonic bandgap crystal as a replacement for VBG because they are interchangeable or sometimes the photonic crystal is called as grating.

With respect to claim 69, the claim further recites the photonic bandgap crystal being a volume diffractive grating. This is considered as intended use. Therefore the claim limitation is considered disclosed by Volodin.

4. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Volodin et al. (Holographic Volume Bragg Gratings Stabilize Laser Diode Performance, November 2003, provided as admitted prior art by applicant, which is hereby referred as "APA") in view of Thornton (US 20050008058). Volodin discloses the claimed invention except for explicitly teaching the reflector being arranged and configured to provide selective feedback to the diode laser such that the sidemode suppression ratio (SMSR) in the light source is greater than -30dB. Thornton discloses an external cavity laser as shown in Fig. 1. Thornton further discloses the SMSR being greater than -30dB as required for typical communication systems to suppress undesirable modes (paragraphs 75-77). It would have been obvious to one skilled in the art at

Art Unit: 2828

the time the invention was made to configure the reflector (feedback unit) to provide such SMSR.

5. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Volodin et al. (Holographic Volume Bragg Gratings Stabilize Laser Diode Performance, November 2003, provided as admitted prior art by applicant, which is hereby referred to as "APA"). APA discloses the claimed invention with the reflector having a reflectivity spectral width that is about 0.05 to 0.5 nm. The claim requires a reflectivity spectral width that is less than 0.01 nm. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the spectral width less than 0.01 nm, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

6. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sutter et al. (US 20040042522) in view of Volodin et al. (Holographic Volume Bragg Gratings Stabilize Laser Diode Performance, November 2003, provided as admitted prior art by applicant, which is hereby referred to as "APA"). Sutter discloses a disk laser shown in Fig. 1 with a pump source 12, an optical coupler 20 and an active medium 14 except for the reflector as claimed. APA discloses the claimed invention with the claimed reflector except for explicitly teaching the active medium is an active medium of a disk laser. It would have been obvious to one skill in the art at the time the invention was made to provide a narrow band width pump source as taught by APA to Sutter in order to provide a significant impact on the output of the laser due to the

Art Unit: 2828

narrow band width of the pump source matching with the active medium (paragraphs 6 and 8).

APA further discloses in col. 2, page 69 the advantage of having a narrow bandwidth using the reflector.

7. Claims 7, 9, 13-15, 17 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Volodin et al. (Holographic Volume Bragg Gratings Stabilize Laser Diode Performance, November 2003, provided as admitted prior art by applicant, which is hereby referred as "APA") in view of Volodin et al. (US 20050018743).

With respect to claims 7 and 9, APA discloses the claimed invention except for explicitly teaching a peak reflectivity of the reflector that is greater than a reflectivity of an output facet of the diode laser.

Volodin discloses a similar claimed invention (as mentioned in the previous Office Action) except for teaching the spectral width of the reflector being less than 0.2 nm after the limitation being added to the claims.

As mentioned in the previous Office Action, in Figs. 1A and 1B, the reflector 106/116 has a peak reflectivity that is greater than a reflectivity of an output facet of the laser diode in order to reflect the broader range of wavelengths back to the laser diode aperture (paragraph 78) and the reflectivity of the output facet is less than about 50% or less than about 3% (paragraph 57). It would have been obvious to one skill in the art at the time the invention was made to provide to realize the peak reflectivity of the reflector being greater than that of the output facet of the laser diode in an external cavity laser.

Art Unit: 2828

With respect to claims 13-14 and 65, Volodin discloses the reflector (VBG element) being configured to focus the light from the laser diode along a slow axis of the laser diode.

With respect to claim 15, Volodin discloses wherein the reflector is configured to enhance the gain of a desired lateral mode over the gain of other lateral modes to increase a brightness of the output beam/wherein the reflector is configured to enhance optical feedback to the diode laser in a desired optical mode relative to other optical modes (paragraph 65). It's noted that the desired optical mode is single mode.

With respect to claim 17, see paragraph 73.

With respect to claim 26, see paragraph 53.

With respect to claim 44, see paragraphs 49-50, 56, and 58...

With respect to claim 45, since the laser diodes are multimode lasers, it is considered as wide stripe emitter. Also see applicant's specification, in last paragraph of page 1.

With respect to claims 46 and 64, it is inherent that light reflected back to the laser diode by the VBG elements acts to discriminate undesired spectral mode.

With respect to claim 47, see Fig. 1 for the reflected light from the reflector 106/116. Other device such as lens 104 does not provide any feedback to the laser diode.

With respect to claim 48, as described above, the diode lasers 100/110 are multimode lasers by themselves.

With respect to claim 58, discloses the claimed invention except for the reflectivity of the output facet being less than about 3%. It would have been obvious to one having ordinary skill in the art at the time the invention was made to low reflection output facet (less than about

Art Unit: 2828

3%), since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

With respect to claims 59 and 60, Volodin discloses in Figs. 3 and 5 the lasers 141 being arranged in an array on a single chip and in Figs. 6 and 8 the lasers 151 and 171 being arranged in multiple single-chip array, and wherein the arrays are stacked on top of each other.

Allowable Subject Matter

8. The following is an examiner's statement of reasons for allowance: Claims 35-37, 41, 43, 61 and 67 are allowed. The reason could be found in the applicant's argument, dated on 1/22/2010.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Communication Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip Nguyen whose telephone number is 571-272-1947. The examiner can normally be reached on 9:00 AM - 6:00 PM, Monday-Thursday.

Art Unit: 2828

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MINSUN HARVEY, can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Phillip Nguyen/

AU 2828

/Minsun Harvey/

Supervisory Patent Examiner, Art Unit 2828